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IS 6273-2 (1971): Guide for Sensory Evaluation of Foods, Part II: Methods and Evaluation Cards [FAD 16: Foodgrains, Starches and Ready to Eat Foods]

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Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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Indian Standard

GUIDE FOR
SENSORY EVALUATION OF FOODS

PART II METHODS AND EVALUATION CARDS

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SENSORY EVALUATION OF FOODS
PART II METHODS AND EVALUATION CARDS

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Indian Standard

GUIDE FOR
SENSORY EVALUATION OF FOODS

PART II METHODS AND EVALUATION CARDS

0. FOREWORD

0.1 This Indian Standard (Part II) was adopted by the Indian Standards Institution on 15 September 1971, after the draft finalized by the Sensory Evaluation Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 Sensory evaluation of foods is assuming increasing significance, as this provides information which may be utilized for quality control, assessment of process variation, cost reduction, product improvement, new product development and analysis of market.

0.3 This standard provides guidelines for sensory evaluation for all the above objectives in general; in particular, it covers laboratory testing in respect of new product development and for determining consumer reaction. However, it is recognized that for commercial purposes, the existing practices of testing tea, coffee, etc, would continue. In any case, this standard would be applicable to new products developed from tea and coffee as well.

0.4 To derive maximum benefits from sensory evaluation, it is necessary to follow the methodology in its full scientific perspective. It is, therefore, necessary to: (a) use standard terminology [*see* IS : 5126 (Part I)-1969* and IS : 5126 (Part II)-1969†]; (b) select the panel properly; (c) maintain suitable environmental conditions and use standard equipment for the test; (d) obtain representative samples; (e) prepare and present samples suitably and uniformly; and (f) select the methods and statistical techniques carefully. This part of the standard provides guidelines on all the methods of sensory evaluation and evaluation cards, Part I of this standard covers details on (b), (c), (d) and (e) and a detailed standard is being prepared on statistical evaluation of results.

0.5 Two types of analysis are broadly followed in sensory evaluation of foods: (a) laboratory analysis with trained and Discriminative and

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*Glossary of general terms for sensory evaluation of foods: Part I Methodology.

†Glossary of general terms for sensory evaluation of foods: Part II Quality characteristics.

Communicative (D and C) panelists for product development and quality control; and (b) consumer analysis with D and C and untrained panelists for ascertaining acceptability.

0.6 All test methods for sensory evaluation are summarized in Appendix A. The tests are grouped for convenience and clarity according to the judgements aimed at, such as qualitative differences (difference tests and ranking tests); quantitative differences (rating tests); and quality attribute analysis (dilution tests or flavour profile tests). The appendix also includes recommendations on the type and number of panelists, number of samples per test, statistical methods of analysis of data, besides indicating the purpose for which these methods have been used.

0.7 Problems of sensory evaluation are individual and the test employed overlap in their area of applicability. The selection of a particular test method will depend on the defined objective of the test, accuracy desired, the finance and personnel available for conducting the evaluation. The test method selected should be appropriate to the problem, efficient and practical.

0.8 The evaluation cards are type specimens which may be appropriately modified in wordings to suit the problem.

0.9 All pertinent details, such as definition, design of experiment, preparation and presentation of samples, specimen evaluation card, variation in inter- and intra-panel data, statistical method for analysis of data and inference should be given in the final report.

0.10 In the preparation of this standard substantial assistance has been derived from the accumulated testing experience of the Central Food Technological Research Institute (CSIR), Mysore.

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1. SCOPE

1.1 This standard (Part II) covers the test methods and specimen evaluation cards which are commonly used in the panel selection and sensory evaluation of foods.

2. TERMINOLOGY AND BASIC REQUIREMENTS

2.1 For the purpose of this standard, the terms given in IS : 5126 (Part I)-1969* shall apply.

2.2 The test shall be carried out under the environmental and experimental conditions specified in IS : 6273 (Part I)-1971†.

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*Glossary of general terms for sensory evaluation of foods: Part I Methodology.
†Guide for sensory evaluation of foods: Part I Optimum requirements.

3. STATISTICAL ANALYSIS OF DATA

3.1 The statistical analysis of data obtained by the following test methods shall be carried out according to IS : 6273 (Part III)*.

NOTE — Until this standard is published, the matter shall be subject to agreement between the concerned parties.

4. METHODS OF TEST

4.0 The following clauses illustrate the test methods, field of application, the evaluation cards and statistical analysis of data (*see* Appendix A).

4.1 Difference Tests

4.1.0 These tests are employed to evaluate qualitative and quantitative differences and preference between test products, and to select panel members. The three basic types of differences are: (a) simple difference; (b) directional and quantitative difference; and (c) quality preference difference. The forced-choice forms of difference tests are sensitive and are used when differences are small. Ranking tests are quicker and useful in screening products especially when single characteristics are evaluated and also when a suitable rating is not available.

4.1.1 *Paired Comparison Test*

4.1.1.1 *Field of application* — This test is used to find simple difference and directional difference in a specific characteristic and difference preference in consumer analysis of foods. This is also applicable in training and testing of panelists.

4.1.1.2 *Procedure* — Present coded sample in pair(s), in each pair one being the reference and the other the test sample. Identical samples in a few pairs may be given to test the individual's discriminative ability as a panelist. In simple difference test, ask the panelists to test whether the samples in each pair are the same or different. In directional difference test, ask them to indicate which sample in the pair has greater or lesser degree of intensity of a specified sensory attribute. In the difference preference test, ask them to indicate if the pair is different and if different whether the preferred sample is for the specified attribute or overall quality or acceptability.

4.1.1.3 *Evaluation card* — Use the evaluation cards given in Tables 1A and 1B.

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*Guide for sensory evaluation of foods: Part III Statistical analysis of data (*under preparation*).

4.1.1.4 *Analysis of data*

a) Adopt sequential procedure for panel selection;

b) Analyse the data by binominal or multinominal distribution (probability tables) for panel selection, product difference and preference; and

c) When number of observations exceeds the table value, use X^2-test or *t*-test for percentage for product difference or preference.

4.1.2 *Duo-Trio Test*

4.1.2.1 *Field of application* — This test, used to detect difference between samples, has an orientation factor through a reference supplied. It is especially used in situations where different products or flavours are tested in the same session for same quality attributes. The test may be used only when the inter-sample carry-over effects are absent or if present are only slight. This is also used for training and testing of panelists.

4.1.2.2 *Procedure* — This test involves three samples — two identical and one different. Any one of the samples — the reference or the test may be duplicated. Give first one of the identical samples as known reference and then the other two as coded. Ask the panelists (trained) to pick out the sample in the coded pair matching with the reference sample.

4.1.2.3 *Evaluation card* — Use the evaluation card given in Table 2.

4.1.2.4 *Analysis of data* — *see* **4.1.1.4**.

4.1.3 *Triangle Test*

4.1.3.1 *Field of application* — This test is used to detect differences between samples as well as for training and testing panelists. Statistically, this test is more efficient than other difference tests. This test is used where inter-sample effects are minimum.

4.1.3.2 *Procedure* — Present each panelist (trained) with three coded samples — two identical (reference) samples and one test sample. Ask the panelist to indicate which of the three is the odd sample. Obtain a positive answer. Two samples *A* and *B* may be presented in two combinations *AAB* and *BBA* (which may be given in six arrangements *AAB*, *BBA*, *BAA*, *BAB*, *ABB* and *ABA*). In general, it is preferable to give the sample which is stronger in odour or taste as the odd sample.

4.1.3.3 *Evaluation card* — Use the evaluation card given in Table 3.

4.1.3.4 *Analysis of data* — *see* **4.1.1.4**.

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4.1.4 *Ranking Test*

4.1.4.1 *Field of application* — This test is used to rank several samples for identity of a single attribute (intensity ranking) or for preference of overall quality (preference ranking).

4.1.4.2 *Procedure* — Present each panelist (trained or D and C) with all samples simultaneously including the unidentified reference sample (if any, as predetermined control) as coded samples. Ask the panelists to rank all samples in the order according to the intensity of the specified attribute. In overall quality analysis, ask the panelists (D and C or untrained) to rank the coded samples according to their preference.

4.1.4.3 *Evaluation card* — Use the evaluation card given in Table 4.

4.1.4.4 *Analysis of data*

a) For panel agreement, calculate coefficient of concordance. If the number of samples exceeds 7 adopt X^2-test;

b) Adopt rank sum analysis for product difference/preference when the number of observations is within 20;

c) Use X^2-test for product difference/preference;

d) Adopt analysis of variance for the ranks converted to normal scores for multiple comparison; and

e) Adopt Bradley-Terry Method for multiple comparisons when the samples are ranked two by two.

4.2 Rating Tests

4.2.0 These tests are difference tests with a quantitative aspect through direction and degree of judgement using suitable defined scales or scores.

4.2.1 *Single Sample (Monadic) Test*

4.2.1.1 *Field of application* — This test is used to test foods that have a pronounced after-effect or flavour carry-over which precludes testing a second sample at the same session. To compare the results of several samples, each sample has to be evaluated singly in different sessions.

4.2.1.2 *Procedure* — Ask each panelist (trained) to indicate presence or absence and intensity or both of a particular quality attribute on a given sample. Compare the results of two or more samples evaluated at different times.

4.2.1.3 *Evaluation card* — Use the evaluation card given in Table 5.

4.2.1.4 *Analysis of data* — Convert the data on intensity to numerical score and analyse by analysis of variance.

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4.2.2 *Two Stage Triangle Test*

4.2.2.1 *Field of application* — This test is a variation of the triangle test with similar application but additionally measures the direction and degree of difference in a specific quality attribute or measures the preference between the odd and identical samples.

4.2.2.2 *Procedure* — Present each panelist (trained) with three coded samples — two identical (reference) samples and one test sample. Ask the panelists first to indicate which of the three is odd sample. Obtain a positive answer. Next ask the panelists to indicate the direction of difference between the odd and the identical samples and the degree of difference on a 5-point scale — ' very slight difference ' (1) to ' extreme difference ' (5). Instead of direction and degree of difference, ask the panelists to indicate their preference between the odd and identical samples.

4.2.2.3 *Evaluation card* — Use the evaluation card given in Tables 6A and 6B.

4.2.2.4 *Analysis of data* — The odd sample identification is analysed by binominal distribution. Discard the data of the panelists whose odd sample identification is incorrect. Treat the difference scores by analysis of variance. If preference data is collected at the second stage, use binominal distribution.

4.2.3 *Two Sample Difference (for a Specified Attribute) Test*

4.2.3.1 *Field of application* — This test is a variation of the paired comparison test and additionally measures the direction and degree of difference in a specified quality attribute.

4.2.3.2 *Procedure* — Serve each panelist (trained or D and C) four pairs of samples. Each pair shall consist of a reference and a test sample. In two pairs the test sample shall be a duplicate of the reference. In the other two pairs the test sample shall be the test variable. Ask the panelist to evaluate each pair independently for the direction and degree of difference between the test sample and the reference on a scale of ' no difference ' (0) to ' extreme difference ' (5).

4.2.3.3 *Evaluation card* — Use the evaluation card given in Table 7.

4.2.3.4 *Analysis of data* — Reject the data from the panelists whose score between coded duplicate differs by more than two points. The scores assigned to the coded duplicate reference sample is deducted from the scores assigned to the test samples. Treat the difference scores by analysis of variance.

4.2.4 *Multiple Sample Difference (for Quality Attributes) Test*

4.2.4.1 *Field of application* — In this test more than one quality attribute is evaluated per session for direction and degree of difference and for comparing a number of test samples but with reduced reliability.

4.2.4.2 *Procedure* — Present a reference sample to each panelist (trained or *D* and *C*). Give 3 to 6 coded samples depending upon the number of quality attributes and ask the panelists to compare each one of the samples with the reference. Ask the panelists to test the direction and degree of difference in each quality attributes of each coded sample compared to the reference sample, on a 6 point scale ' no difference ' (0) to ' extreme difference ' (5). To test the discriminative ability of panelists duplicate the reference sample as one of the coded samples.

4.2.4.3 *Evaluation card* — Use the evaluation card given in Table 8.

4.2.4.4 *Analysis of data* — Reject the data from panelist whose score between two coded duplicates differ by more than two points. Whatever the panelist assigns to the coded duplicate reference sample is subtracted from the score he assigns to the test samples. Treat the difference scores by the analysis of variance.

4.2.5 *Hedonic Rating Test*

4.2.5.1 *Field of application* — Hedonic rating is used to measure the degree of pleasurable or unpleasurable experiences with foods. In general this test measures the overall quality of foods and is used in consumer analysis for a new product acceptability and in pilot consumer analysis with *D* and *C* panelists.

Food action (FACT) rating scale is a modified hedonic form having usually a 9 point successive category scale verbally anchored to reflect the action the panelist will take in response to food. This is used to measure food preferences and is applicable to evaluation of general attitude to the stimulus but not for individual quality attributes.

4.2.5.2 *Procedure* — Present each panelist (*D* and *C* or untrained) with one or more samples in one session. Ask the panelists to rate the acceptability of each sample on a 7/9-point or food action rating scale (hedonic) (ranging from ' dislike extremely ' to ' like extremely ' or ranging from ' I would eat this if I were forced to ' to ' I would eat this every opportunity I had '). In testing foods which have pronounced after-effect or flavour carry-over which precludes testing a second sample at the same session, carry out the test with single sample on different days with the same panelists or with different groups of panelists and compare the results.

4.2.5.3 *Evaluation card* — Use the evaluation card given in Tables 9A and 9B. *Use separate cards for each sample.* When two or more samples are

being compared or in consumer preference for different foods, use evaluation card containing two or more columns of the scale as required.

4.2.5.4 *Analysis of data*

   a) For quick analysis, convert the hedonic or FACT rating to ranks and adopt rank sum or chi-square analysis;

   b) For rigorous analysis, convert the ratings to numerical scores and use analysis of variance.

4.2.6 *Facial Hedonic (Smiley) Test*

4.2.6.1 *Field of application* — The facial hedonic test is a type in which faces are used to portray graphically the degree of pleasurable or unpleasurable experience with food acceptability rather than word descriptions. The number of faces range from five to seven. The test is not affected by individual intelligence level, education or ability to communicate.

4.2.6.2 *Procedure* — Ask each panelist to check the box under the face which describes how he or she feels about the sample. *Use separate cards for each sample.*

4.2.6.3 *Evaluation card* — Use the evaluation card given in Table 10.

4.2.6.4 *Analysis of data*

   a) For quick analysis convert the facial hedonic scales to ranks and adopt rank sum analysis, and

   b) For rigorous analysis convert to numerical scores and adopt analysis of variance.

4.2.7 *Numerical Scoring Test*

4.2.7.1 *Field of application* — This test, usually on a 10-point uniform scale, is designed to evaluate the quality of a set of similar products, new product development, quality maintenance for determining the contribution coefficients for a composite scoring scale. This test is also used for assessing the consistency of and between the panelists during training and evaluation.

4.2.7.2 *Procedure* — Train the panelists to follow the sensory attributes corresponding to the agreed quality and grade description and scores. Present each panelist (trained) with one or more samples in random order or on the basis of a statistical design. Ask the panelists to evaluate each sample on a 10-point uniform scale for one or more quality attributes. Use different score cards for each attribute when the score for one attribute is likely to affect the score of others. *Use separate cards for overall quality.*

4.2.7.3 *Evaluation card* — Use the evaluation card given in Tables 11A and 11B.

4.2.7.4 *Analysis of data*

   a) Adopt *t*-test to compare two samples,

   b) Adopt Dunnett's test for comparison of samples against a predetermined control,

c) Adopt range method for multiple comparison, and

d) Adopt Duncan's Multiple Range Test for multiple comparison.

4.2.8 *Composite Scoring Test*

4.2.8.1 *Field of application* — This test is used for product comparison *and overall quality grading by a trained panel following the weighted score scheme for quality attributes prepared for each product type.*

4.2.8.2 *Procedure* — *Provide a weighted rating scale for individual* quality attributes based on their relative importance contributing to overall quality of the product. Train the panelists in use of this weighted scoring scheme by following a quality description and grading of the product. Present the panelists one to four samples individually. Ask the panelists to evaluate each sample and to rate individual quality attributes on a weighted scale which they are trained to use. Compound the scores assigned for individual quality attributes by any one panelist and the composite score indicates the overall quality on a maximum of 100 points.

4.2.8.3 *Evaluation card* — Use the evaluation card given in Table 12.

4.2.8.4 *Analysis of data* — *see* **4.2.7.4.**

4.3 Sensitivity Tests — These tests measure the ability of the individuals to smell, taste or feel specific characteristics in food or beverage. They are used most frequently in selecting panel members for evaluation in product research and development; these tests are most frequently used in selecting panel members.

4.3.1 *Threshold Tests*

4.3.1.1 *Field of application* — Threshold tests with basic tastes and odours are employed for panel selection. These tests are used where minimum detectable difference, known as 'just noticeable difference' (jnd) of an additive or of an off-flavour is to be established by trained panel. For selection of a reasonably homogeneous panel, the data from homogeneous panel is used in product evaluation.

4.3.1.2 *Procedure* — Give each panelist (trained or untrained) in increasing concentration of the taste or odour substances in a series. One or two blanks are introduced in the beginning of the series. Ask the panelists to test all the samples one by one in the given order and record if the sample is like water or different from water. Indicate the sample when taste/odour is clearly recognized. Ask him to evaluate the remaining samples for their degree of intensity of the flavour. Inform the panelists that the series is in increasing intensity and retesting is prohibited.

4.3.1.3 *Evaluation card* — Use the evaluation card given in Table 13.

4.3.1.4 *Analysis of data* — The identification threshold concentrations (sensivity of individual panelists) and just noticeable difference values are found from the panel data. The data from the homogeneous panel is used for product evaluation by finding arithmetic or geometric mean according to concentration series given.

4.3.2 *Dilution Test*

4.3.2.1 *Field of application* — The dilution test is devised to establish intensity of sensory responses of a food or food components. The test establishes the smallest amount of an unknown that can be detected when it is mixed with a diluent or standard material, for instance, margarine in butter. Sensitivity and reproducibility of the test depends on the screening and training of panel member in respect of identification and intensity differences of flavour with suitable standard. This test is used effectively in determining quality of dried whole milk, dried egg powders, perfume, spices, etc.

4.3.2.2 *Procedure* — Select a suitable reference. Establish an upper limit of the concentration of test substance(s) in a mixture for the series, that is, the highest concentration which is reasonably to be subjected to formal testing. Decide on a lower limit of concentration for the series such that it is very unlikely that any panelist will be able to detect a difference between it and the reference reliably. Define a series of concentrations including those which represent the upper and lower limits. Usually six are enough, although eight may be used if greater precision is desired. A log series is more efficient in most cases, although a series based on arithmetic progression may be used. Test the series of concentrations against the reference using the threshold tests or difference tests. Obtain 15 to 20 judgements for each member of the series.

4.3.2.3 *Evaluation card* — Use the evaluation card given in Table 12.

4.3.2.4 *Analysis of data* — Find the arithmetic or geometric mean for the group and express as dilution number or dilution index which is defined as the percentage or ratio of the test substance in one mixture when the substance is just identifiable. When expressing it as single mean value is not satisfactory, give it as one or two sigma range.

4.4 Descriptive Tests — These tests identify the perceptual characteristics of a product and define them with suitable descriptive terminology to determine their relative intensities. They record the impact of all quality attributes in a total perspective but not the single attribute judgement with precision for statistical analysis.

4.4.1 *Quality Attribute and Description Check List* — This is an exploratory method used to develop information for attributes of product that may be important to the consumers. This is done through round table discussion. The overall quality of product is broken down to recognizable parts and appropriate verbal description developed to enable qualitative and semi-quantitative variations between products to be evaluated. Flavour profile and texture profile methods are further developments in this line.

4.4.2 *Flavour Profile Test*

4.4.2.1 *Field of application* — This test is used to describe the aroma and flavour characteristics of food products. It may be used in its entirety to provide a complete description of a sample or to show differences among

a group of samples; also it may be used to identity the specific note, such as off-flavour, or to show changes in intensity of a particular quality.

4.4.2.2 *Description* — With suitable training of panelists, the flavour profile method may be developed into a qualitative and semi-quantitative method describing the flavour complex by the following:

a) *Character notes* — aroma, taste, mouthfeel described in qualitative and associative terms;

b) *Intensity* — rated on a scale of anchored points, for example, slight, moderate and strong;

c) *Order of appearance* — time sequence in which the aroma components are detected;

d) *After-taste* — sensory impression left in the mouth after removal of stimulus from mouth; and

e) *Amplitude* — initial overall intensity impression of the different factors, reflecting the degree of blending, quality of individual factors detected, appropriateness of the observed factors and the fullness of the product.

4.4.2.3 *Procedure* — A frame of reference shall be developed by examining representative samples of the product type. The panel leader shall arrange for the orientation and formal panel sessions and the open panel session to sort out problems of semantics and disputed points and shall interpret the panel results to the others in a meaningful way. Panel members shall be carefully selected and rigorously trained before these methods are used. One or more samples shall be evaluated at several test sessions. Reference samples shall be used for clarification of description and intensity of flavour attributes. The records shall be made on agreed profile pattern for each product. Each session shall be followed by a round table discussion.

4.4.3 *Texture Profile Test*

4.4.3.1 *Field of application* — This is used to describe the texture — sensory manifestation of structure or inner make up of foods, comprising popular concepts of texture, body, and consistency — of foods. In its entirety, the texture profile like flavour profile provides a descriptive analysis of the texture complex in terms of its component parts or to show differences among samples qualitatively or quantitatively in one or more component parts.

4.4.3.2 *Description* — The texture profile test determines the texture complex of a food in terms of its mechanical (related to reaction of foods to stress); geometrical (related to size, shape and arrangements of particle within foods); and other characteristics related to fat and moisture content. The degree or intensity of each present and the order of appearance from first bite through complete mastication is also determined. In the order of

appearance, texture characteristics follow a definite pattern:

a) Initial (Perceived on first bite)
1) Mechanical — hardness, viscosity fracturability.
2) Geometrical — depending on product structure.

b) Masticatory (Perceived during chewing)
1) Mechanical — gumminess, chewiness, adhesiveness.
2) Geometrical — depending on product structure.

c) Residual (Changes perceived during mastication)
1) Rate of break-down.
2) Type of break-down.
3) Moisture absorption.
4) Mouth coating.

The evaluation of the mechanical characteristics is qualitative and could be quantified by the use of selected reference samples representing a point on a standard scale. Standard rating scales are devised for each of the mechanical characteristics, such as hardness, fracturability, viscosity, gumminess, chewiness and adhesiveness by selection of foods from major brands with good quality control, requiring minimum preparations and having good shelf-life. The food samples are standardized with respect to size, temperature, preparation for use as standards in tests for stabilizing the scale points.

The standard rating scales and reference standards also provide a method for correlating sensory and instrumental evaluations of texture. The exact technique for evaluating each of these characteristics needs to be standardized with an understanding of the force involved and is learned during training with the use of the standards. Strict observance of the agreed technique is followed during evaluation of product.

Geometrical characteristics are evaluated qualitatively as gritty, grainy or coarse relating to shape of particles and as fibrous, cellular and crystalline relating to shape and orientation. Selected food items are used as examples for the different characteristics. Semi-quantitative evaluations of the amount or intensity could also be done.

Residual characteristics are related to perception of moisture and fat content of a food. The effects vary in different foods and evaluations are to be standardized for product types.

4.4.3.3 *Procedure* — The panel leader shall arrange for the orientation and formal sessions and the open panel sessions to sort out problems of uniform understanding of definitions and procedures, resolve disagreements and arrive at an average rating. The panel leader should also be responsible for selecting and maintaining reference standards. The evaluation

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should be individually on an agreed pattern and procedure and the results should be finalized in a round table discussion.

Select the panel carefully and train them in definitions, the texture classification system, the evaluation procedure for each characteristic, an appreciation of reference standards in relation to the scale. In practice-sessions several products should be used with varying make up of textural characteristics and components for orientation as to quality and magnitude and to establish standard procedures with respect to the product under test.

TABLE 1A SPECIMEN EVALUATION CARD FOR PAIRED COMPARISON TEST (SIMPLE DIFFERENCE)

(*Clause* 4.1.1.3)

Name_____   Date_____

Product_____   Time_____

You are given one or several pairs of samples.

Evaluate the two samples in the pair for difference in*_____

Indicate your judgement by crossing out words not applicable.

PAIR No.	CODE No. OF PAIRS		YOUR JUDGEMENT
1	_____	_____	Different/Not different
2	_____	_____	Different/Not different
3	_____	_____	Different/Not different
4	_____	_____	Different/Not different

*The panel organizer should indicate quality attributes to be evaluated.

Signature

TABLE 1B SPECIMEN EVALUATION CARD FOR PAIRED COMPARISON
(DIRECTIONAL DIFFERENCE/PREFERENCE)

(*Clause* 4.1.1.3)

Name——————————————   Date——————————————

Product——————————————   Time——————————————

You are given one or several pairs of samples.

Evaluate the two samples in the pair for difference/preference in*————————

Indicate your judgement by crossing out words not applicable.

If different, indicate the Code No. of the sample which is more*————————/preferred.

PAIR NO.	CODE NO. OF PAIRS		YOUR JUDGEMENT	IF SAMPLES IN A PAIR ARE DIFFERENT, CODE NO. OF SAMPLE WHICH IS MORE*_____/PREFERRED
1	————	————	Different/Not different	————————
2	————	————	Different/Not different	————————
3	————	————	Different/Not different	————————
4	————	————	Different/Not different	————————

*The panel organizer should indicate the quality attributes to be evaluated.

Signature

TABLE 2 SPECIMEN EVALUATION CARD FOR DUO-TRIO TEST

(*Clause* 4.1.2.3)

Name——————————————   Date————————————————

Product————————————.   Time—————————— ——————————

The first sample ' R ' is the reference sample.

Test it carefully.

From the pair of coded samples next given, judge which sample is the same as ' R '.

PAIR NO.	CODE NO. OF PAIRS		CODE NO. OF SAMPLE MATCHING WITH 'R'
1	————	————	————————
2	————	————	————————
3	————	————	————————
4	————	————	————————

Signature

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TABLE 3   SPECIMEN EVALUATION CARD FOR TRIANGLE TEST

(*Clause* 4.1.3.3)

Name_____   Date_____   _____

Product_____   Time_____

Two of the three samples are identical.

Determine the odd sample.

PAIR No.	CODE No. OF SAMPLES			CODE No. OF ODD SAMPLE
1	_____	_____	_____	_____
2	_____	_____	_____	_____
3	_____	_____	_____	_____
4	_____	_____	_____	_____

Signature

TABLE 4 SPECIMEN EVALUATION CARD FOR RANKING TEST

(*Clause* 4.1.4.3)

Name————————————   Date————————————————

Product————————————   Time————————————————

Please rank the samples in numerical order according to intensity of quality attribute under test of the product or your preference.

INTENSITY/RANKING   CODE No. OF
  PREFERENCE   SAMPLE

First ————————————

Second ————————————

Third ————————————

Fourth ————————————

Comments: (Type of off-flavour, etc)

Signature

TABLE 5 SPECIMEN EVALUATION CARD FOR SINGLE SAMPLE (MONADIC) TEST

(*Clause* 4.2.1.3)

Name_____   Date_____

Product_____   Time_____

Please sniff and taste the sample carefully.

Can you detect off-flavour in the product?

    Circle one   Yes   No

If you detect off-flavour, please describe it below by checking appropriate boxes for any of the intensity and characteristic.

INTENSITY		OFF-FLAVOUR IS DUE TO	
None	☐	Off-odour	☐
Trace	☐		
Small	☐	Off-taste	☐
Moderate	☐	Residual taste	☐
Strong	☐	Other defects	☐

Signature

TABLE 6A   SPECIMEN EVALUATION CARD FOR TWO STAGE TRIANGLE TEST (PREFERENCE BETWEEN ODD AND IDENTICAL SAMPLES)

(*Clause* 4.2.2.3)

Name———————————————   Date————————————————

You receive three samples in each set, two of them are identical.

Check the odd sample for difference only.

The odd samples differs in——————*.

Specify whether you prefer odd sample or the identical.

EXPERIMENT No.	CODE No. OF THE SAMPLES	CODE No. OF ODD SAMPLE	YOUR PREFERENCE†
1	——————————	——————————	Odd/Identical
2	——————————	——————————	Odd/Identical
3	——————————	——————————	Odd/Identical
4	——————————	——————————	Odd/Identical

*Specify the quality of attributes.
†Delete inappropriate words.

Signature

TABLE 6B   SPECIMEN EVALUATION CARD FOR TWO STAGE TRIANGLE TEST (DEGREE AND DIRECTION OF ODD AND IDENTICAL SAMPLES)

(*Clause* 4.2.2.3)

Name_____   Date_____

Product_____   Time_____

You receive three samples for evaluation.

Two of them are identical.

Check the odd sample for difference only.

The odd sample differs in_____*.

Determine the direction and degree of difference of the odd sample compared to the identical samples on the following scale:

DIRECTION OF DIFFERENCE	DEGREE OF DIFFERENCE	SCORE
Odd superior to	Very slight difference	1
Odd inferior to	Slight difference	2
	Moderate difference	3
	Large difference	4
	Extremely large difference	5

EXPERI-MENT No.	CODE No. OF THE SAMPLES	CODE No. OF ODD SAMPLE	DIRECTION	DEGREE
1	_____	_____	_____	_____
2	_____	_____	_____	_____
3	_____	_____	_____	_____
4	_____	_____	_____	_____
5	_____	_____	_____	_____

*Specify the quality attribute.

Signature

TABLE 7 SPECIMEN EVALUATION CARD FOR TWO SAMPLE DIFFERENCE TEST

(*Clause* 4.2.3.3)

Name————————————   Date—————————————

Product—————————————   Time—————————

You receive four pairs of samples.

The first sample in each pair is reference sample.

Determine the direction and degree of the second sample on the following scale for each pair:

DIRECTION OF DIFFERENCE	DEGREE OF DIFFERENCE	SCORE
Superior to reference (S)	No difference	0
Equal to reference (E)	Very slight difference	1
Inferior to reference (I)	Slight difference	2
	Moderate difference	3
	Large difference	4
	Extremely large difference	5

PAIR No.	CODE No. OF PAIRS	JUDGEMENT	DIRECTION	DEGREE (SCORE)	DIFFERENCE IS DUE TO*
1	————	Different/Not different	————	————	————
2	————	Different/Not different	————	————	————
3	————	Different/Not different	————	————	————
4	————	Different/Not different	————	————	————

NOTE — If there is no difference there is no direction or degree.

*Mention odour, taste, texture, etc.

Signature

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TABLE 8 SPECIMEN EVALUATION CARD FOR MULTIPLE SAMPLE DIFFERENCE TEST FOR QUALITY ATTRIBUTES

(*Clause* 4.2.4.3)

Name———————————————   Date——————————— —————————

Product——— ————·———————   Time——————— ——— ———————

You are given a reference sample (R).

Test it carefully for the quality attribute to be evaluated.

You are next given a number of samples which
are to be compared with ' R ' for————*.

The test sample may or may not be different from ' R '.

Rate direction and degree of difference in each sample according to following scale:

DIRECTION OF DIFFERENCE	DEGREE OF DIFFERENCE	SCORE
Superior to reference (S)	No difference	0
Equal to reference (E)	Very slight difference	1
Inferior to reference (I)	Slight difference	2
	Moderate difference	3
	Large difference	4
	Extremely large difference	5

SAMPLE CODE NO.	ODOUR		TASTE		TEXTURE	
	Direction	Degree	Direction	Degree	Direction	Degree
———	———	———	———	———	———	———
———	———	———	———	———	———	———
———	———	———	———	———	———	———
———	———	———	———	———	———	———
———	———	———	———	———	———	———
———	———	———	———	———	———	———

*Mention odour, taste, texture, etc.

Signature

TABLE 9A SPECIMEN EVALUATION CARD FOR HEDONIC RATING TEST

(*Clause* 4.2.5.3)

Name——————————————   Date——————————————

Product ————————————   Time——————————————

Test this sample and check appropriate box how much you like or dislike.

Use the appropriate scale to show your attitude by checking at the point that best describes your feeling about the sample

Please give your reason for this attitude.

Remember you are the only one who can tell what you like.

An honest expression of your personal feeling will help us.

CODE No.————

Like extremely   ⬜

Like very much   ⬜

Like moderately   ⬜

Like slightly   ⬜

Neither like nor dislike   ⬜

Dislike slightly   ⬜

Dislike moderately   ⬜

Dislike very much   ⬜

Dislike extremely   ⬜

Comments.

Signature

TABLE 9B   SPECIMEN EVALUATION CARD FOR FOOD
ACTION RATING SCALE

(*Clause* 4.2.5.3)

Name————————————————   Date————————————————————

Product————————————————   Time————————————————————

Indicate in appropriate box which of nine statements on the following scale best represent your attitude towards the product.

CODE No.————————

I would eat this every opportunity I had   ⬜

I would eat this very often   ⬜

I would frequently eat this   ⬜

I like this and would eat it now and then   ⬜

I would eat this if available but would not go out of my way   ⬜

I don't like it would eat it on an occasion   ⬜

I would hardly ever eat this   ⬜

I would eat this only if there were no other food choices   ⬜

I would eat this only if I were forced to   ⬜

Comments.

NOTE — The word ' eat ' may be replaced by ' drink ', ' buy ' or ' use '.

Signature

TABLE 10 SPECIMEN EVALUATION CARD FOR FACIAL HEDONIC
(SMILEY TEST)

(*Clause* 4.2.6.3)

Name_____   Date_____

Product_____   Time_____

Please check the box under the figure which best describes how you feel about this product.

Signature

TABLE 11A   SPECIMEN EVALUATION CARD FOR NUMERICAL SCORING TEST FOR QUALITY ATTRIBUTES

(*Clause* 4.2.7.3)

Name————————————————   Date————————————————

Product————————————————   Time————————————————

Please rate these samples for quality attributes according to the following grade descriptions and scoring:

QUALITY GRADE DESCRIPTION	SCORE
Excellent	9-10
Good	6-8
Fair	4-5
Poor	1-3

CODE NO. OF SAMPLE	COLOUR	APPEARANCE	TEXTURE	TASTE	ODOUR
————	————	————	————	————	————
————	————	————	————	————	————
————	————	————	————	————	————
————	————	————	————	————	————

Signature

TABLE 11B SPECIMEN EVALUATION CARD FOR NUMERICAL SCORING FOR OVERALL QUALITY

(Clause 4.2.7.3[1])

Name——————————   Date——————————

Product——————————   Time——————————

Please rate these samples for overall quality according to the following grade descriptions and scoring:

QUALITY GRADE DESCRIPTION	SCORE
Excellent	9-10
Good	6-8
Fair	4-5
Poor	1-3

CODE NO.	COLOUR	APPEARANCE	TEXTURE	TASTE	ODOUR	OVERALL QUALITY
——	——	——	——	——	——	——
——	——	——	——	——	——	——
——	——	——	——	——	——	——
——	——	——	——	——	——	——

Signature

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TABLE 12   SPECIMEN EVALUATION CARD FOR COMPOSITE SCORING TEST

(*Clauses* 4.2.8.3 *and* 4.3.2.3)

Name_____   Date_____

Product*_____   Time_____

Assign scores for each sample for various characteristics.

QUALITY ATTRIBUTES	MAXIMUM SCORE	CODE No. OF SAMPLES			
Colour	20	_____	_____	_____	_____
Consistency	20	_____	_____	_____	_____
Flavour	40	_____	_____	_____	_____
Absence of defects	20	_____	_____	_____	_____
Total score	100	_____	_____	_____	_____

Comments

*The weighted rating is a typical score applicable to orange marmelades. For other products similar scales have to be worked out.

Signature

TABLE 13 SPECIMEN EVALUATION CARD FOR THRESHOLD TEST

(Clause 4.3.1.3)

Name_____   Date_____

Product_____   Time_____

You receive a series of samples with increasing concentrations of one of the 4 taste
qualities (sweet, salty, sour, bitter)*.

Start with sample No. 1 and continue with sample No. 2, No. 3, etc.

Retasting of already tested solutions is not allowed.

Describes the taste* and the feeling factors and give intensity scores.

Use the following intensity scale:

0 = None or pure water taste

? = Different from water, but taste quality not identifiable

X = Threshold very weak (identify the taste)

1 = Weak

2 = Medium

3 = Strong

4 = Very strong

5 = Extremely strong

SAMPLE NO.	DESCRIPTION OF TASTE AND FEELING FACTORS
1	_____
2	_____
3	_____
4	_____
5	_____
6	_____
7	_____
8	_____
9	_____
10	_____
11	_____
12	_____

*To be modified for odour analysis.

Signature

APPENDIX A

(*Clauses* 0.6 *and* 4.0)

SUMMARY OF SENSORY TEST METHODS

METHOD (CLAUSE No.)	PANELISTS		No. OF SAMPLES PER TEST	TABLE No. FOR EVALU- ATION CARD	STATISTICAL ANALYSIS OF DATA	FIELD OF APPLICATION
	Type	Number				
(1)	(2)	(3)	(4)	(5)	(6)	(7)
I *Difference Tests* (*Qualitative*)						
A Paired comparison test (4.1.1)	Trained	5-12	2	1	*see* **4.1.1.4**	Finding simple difference, directional difference, and testing and training panelists. Preference testing and consumer analysis.
	Untrained	72-80				
B Duo-trio test (4.1.2)	Trained	5-12	3 (2 identical 1 different)	2	*see* **4.1.1.4**	Detecting difference when carry-over after-taste if present is only slight. Also for training and testing panels.
C Triangle test (4.1.3)	Trained	5-12	3	3	*see* **4.1.1.4**	Detecting differences when inter-sample effects (after-taste, etc) are minimum. Also for training and testing panels.
D Ranking test (4.1.4)	Trained	5-12	2-7	4	*see* **4.1.1.4**	Determining preference and process improvement; selection of best sample. Pilot consumer analysis. Consumer preference analysis.
	D and *C*	10-25				
	Untrained	72-80				

II *Rating Tests* (*Difference Tests*) (*Quantitative*)

II *Rating Tests*
   (*Difference Tests*)
   (*Quantitative*)

A	Single sample test (4.2.1)	Trained	5-12	1	5	Analysis of Variance	Detecting difference from normal product, off-flavour, off-taste and direction when after-taste and carry-over are present. Evaluation of new product.
B	Two stage triangle test (4.2.2)	Trained	5-12	1-4 sets	6	*see* 4.2.2.4	Difference between samples in direction and in degree in specified characteristic.
C	Two sample difference (for quality attributes) test (4.2.3)	Trained	5-12	4 pairs and control	7	Analysis of Variance	Difference between samples, quantitatively and directionally in a specified characteristic.
D	Multiple sample difference (for specified attributes) test (4.2.4)	Trained	5-12	3-6*	8	Analysis of Variance or Rank Analysis	Comparing samples with more than one variable in the same session (reduced reliability).
		D and *C*	10-25	—			
		Untrained	72-80	1-4			Consumer analysis for preference.
E	Hedonic rating test (4.2.5)	*D* and *C*	10-25†	1-10	9	*see* 4.2.5.4	Pilot consumer analysis for screening by preference.
		Untrained	72-80	1-4	9	*see* 4.2.5.4	Consumer analysis for preference.
F	Facial hedonic test (4.2.6)	Untrained	72-80	1-5	10	Analysis of Variance or Rank Analysis	Consumer analysis for preference.

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* [Depending on the number of quality characteristics evaluated (including standard).]

† Larger number only if mild flavoured or rated for texture only.

Method (Clause No.) (1)	Panelists Type (2)	Number (3)	No. of Samples per Test (4)	Table No. for Evaluation Card (5)	Statistical Analysis of Data (6)	Field of Application (7)
G Numerical scoring test (4.2.7)	Trained	5-12*	1-10	11	see **4.2.7.4**	Screening of quality, new product development, quality maintenance, work out quality, contribution coefficients for composite scoring also to test the consistency of and among panelists during training and devaluation.
H Composite scoring test (4.2.8)	Trained	5-12	1-4	12	see **4.2.7.4**	Comparing several products of same type overall quality grading.
III *Sensitivity Tests*						
A Threshold tests (4.3.1)	Untrained		5-10	13	see **4.3.1.4**	Selecting panel members for evaluation of ingredients, packaging material and maintaining quality.
B Dilution test (4.3.2)	Trained		5-12	—	see **4.3.2.4**	Odour and flavour evaluation of foods; ingredients; product development; quality control. Specially useful for spices.
IV *Descriptive Tests*						
A Flavour profile test (4.4.2)	Trained	3-6	1-5	—	—	Sample characteristics expressed in common terms, sequence, intensity expressed on agreed scale. Used in new product development; product; improvement and storage studies.
B Texture profile test (4.4.3)	Trained	3-6	1-5	—	—	Texture evaluation of foods used in new product development, product improvement and storage studies.

* Larger number only if mild flavoured or rated for texture only.